

First report of Aphid, *Liosomaphis ornata* Miyazaki, 1971 (Hemiptera: Aphididae) from India

Gireesh Nadda^{1*} and Sunil Joshi²

¹Entomology Laboratory, Hill Area Tea Science Division, CSIR-Institute of Himalayan Bioresource Technology, Post Box No. 6, Palampur, Kangra, H.P. INDIA, 176 061.

²National Bureau of Agricultural Insect Resources, Bangalore, Karnataka, INDIA, 560 024.

(e-mail: *girish@ihbt.res.in, girish_nadda@yahoo.co.in)

Abstract

First occurrence of the aphid, *Liosomaphis ornata* Miyazaki (Hemiptera: Aphididae) making colonies on *Berberis lycium* Royle (Berberidaceae) from Naggar, Kullu, Himachal Pradesh, India is reported. The viviparous female is re-described with the help of photographs and measurements. A key to the species of *Liosomaphis* Walker occurring in India is provided.

Keywords: Aphid, *Berberis*, New record, *Liosomaphis*, India.

Received: 16 April 2015; Revised: 27 April 2015; Online: 8 May 2015; Published: 5 November 2015.

Introduction

Berberis lycium Royle (Family: Berberidaceae) is an evergreen shrub present in Himalayan region. It is a medicinal plant, known as Indian berberry in English, Kashmal or Kasmal in Hindi and Ishkeen in Urdu (Sood et al., 2012). *B. lycium* is native to Nepal and is distributed in various parts of the world. It occurs abundantly in the Himalayan regions of India and Pakistan. In India, it has been found in Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh, Sikkim, Madhya Pradesh and Tamil Nadu.

The aphid genus *Liosomaphis* Walker, (1868) belongs to the tribe Macrosiphini of subfamily Aphidinae (Hemiptera: Sternorrhyncha: Aphididae) with *Aphis berberidis* Kalténbach, (1843) as a type species. This genus is distributed in Australia, North America, China, Europe, India, Japan, Nepal, New Zealand, Pakistan and east Siberia (Blackman and Eastop, 2006). So far six species have been described under this genus (Remaudière and Remaudière, 1997), out of which three species have been recorded from India. These species are *Liosomaphis atra* Hille Ris Lambers, *L. berberidis* (Kalténbach) and *L. himalayensis* Basu. In India, *L. atra* has been found to feed on *B. aristata* and *B. asiatica*, while *L. himalayensis* was recorded

infesting *B. aristata*, *B. asiatica*, *B. umbellata* and *B. wallichiana*. *L. berberidis* was recorded on *B. lyceum* and *B. umbellata* (Raychaudhuri, 1983). (*L. atra* Hille Ris Lambers has been recorded on *Berberis* spp. in East Asia (India, Pakistan, China) while *L. berberidis* (Kalténbach) has been recorded on undersides of leaves of *Berberis* and *Mahonia* from Europe, India, and introduced to North America, Australia and New Zealand. *L. himalayensis* Basu is known from India and China on *Berberis* spp., and *L. ornata* Miyazaki is known to occur in Japan and China on *Berberis* spp.). *Liosomaphis atra*, *L. berberidis* and *Myzus persicae* have been reported from *B. lyceum*.

In the present paper, we report the occurrence of *L. ornata* for the first time from India. A redescription of the species in detail is included, along with photographs of the mounted specimen. A key based on apterous viviparous females of *Liosomaphis* species in India is also provided.

Materials and methods

The specimens were collected during surveys from Naggar, Kullu, Himachal Pradesh, India. Nymphs and viviparous apterous females were collected directly from

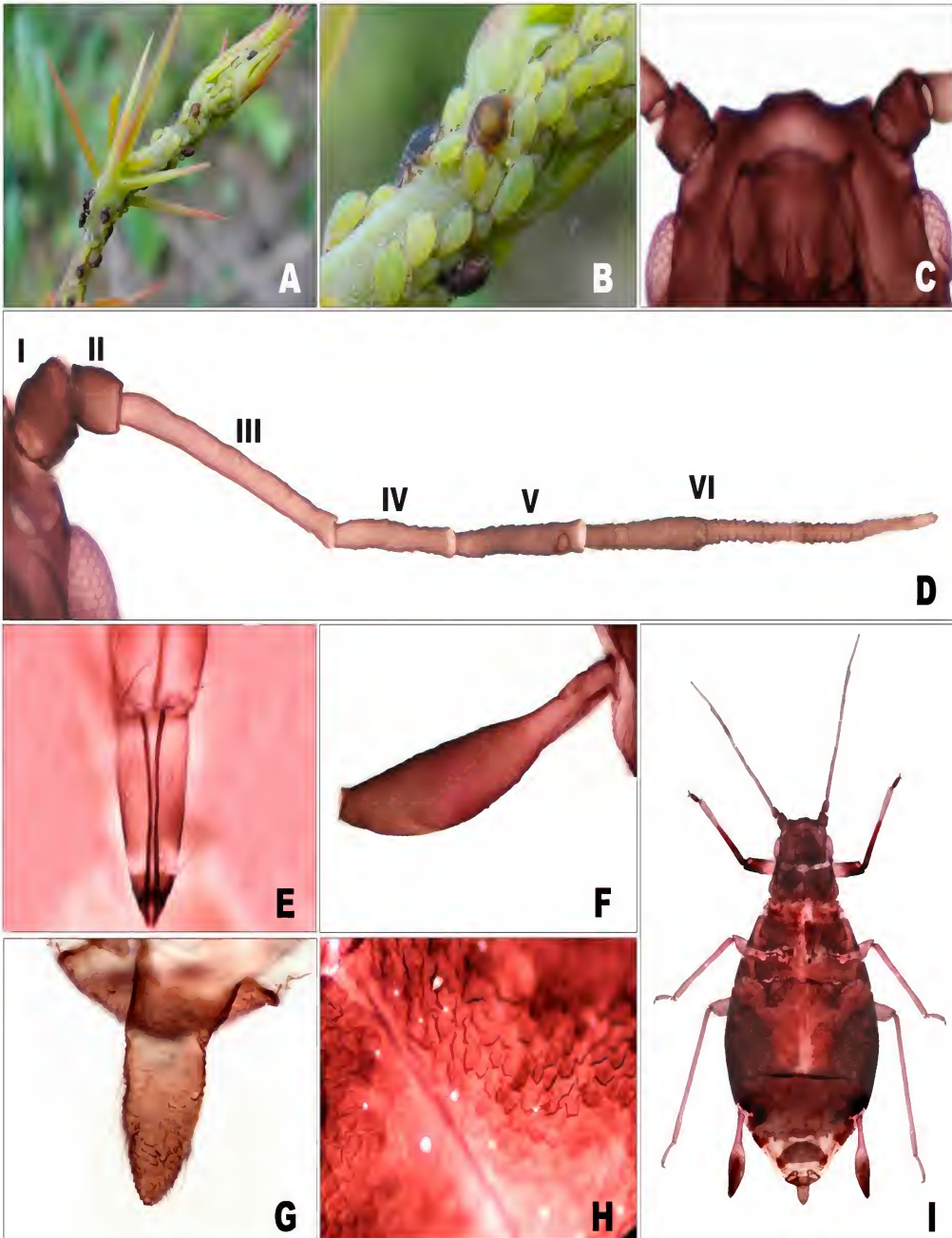


Fig. 1. *Liosomaphis ornata* A, Colony infesting *Berberis lyceum*; B, Nymphs (greenish yellow) and completely grown up female (brown); C, Head; D, Antenna; E, Rostrum; F, Siphunculus; G, Cauda; H, Abdominal pattern; I, Habitus.

the tender shoots and buds of *Berberis lycium* plant (Fig. 1). The specimens thus collected were preserved in 70% ethanol and slides were prepared by following standard procedures (Eastop and van Emden, 1972). Photographs of the mounted aphids were captured with Nikon DS-Vi1 Camera and measurements of different body parts of aphids are taken as suggested by Martin (1983) and Blackman and Eastop (2000) are given in millimetres. All the specimens examined were deposited at the Division of Insect Systematics, Indian Council of Agricultural Research- National Bureau of Agricultural Insect Resources (ICAR-NBAIR), Bangalore, Karnataka, India.

Genus *Liosomaphis* Walker

Liosomaphis Walker, 1868, *Zoologists*, 2(3): 1119.

TYPE - SPECIES: *Aphis berberidis* Kalténbach 1843.

Characters of the genus

Head with dorsum slightly wrinkled, lateral frontal tubercles low and diverging, and median frontal prominence distinct; dorsal cephalic hairs short with incrassate apices. Antennae usually 6-segmented, sometimes 5-segmented, much shorter than body, in apterae 0.33-0.50 and in alatae 0.50-0.90 X body; segment I scabrous wholly on inner margin; secondary rhinaria absent in apterae but in alatae circular, flat rhinaria present on segments III, IV and V, those on dorsum of head; processus terminalis (terminal process) nearly as long as to almost 2.0 X base of last segment. Ultimate rostral segment about 0.75-0.90 X hind tarsal segment 2 and bears 2-3 secondary hairs. Midthoracic furca in apterae with separate arms. Abdominal tergum in apterae pale or variably pigmented, corrugated or even papillated but tergum of 7th and 8th segments and near bases of siphunculi spinulose. Siphunculi nearly subcylindrical basad, distinctly clavate on distal 0.50-0.75 portion and then gradually tapers to a small but distinct flange with 4-5 rows of pre-apical spinulose striae which sometimes join to form small cells, smooth to distinctly rugose, much longer than cauda. Cauda elongate with blunt apex, with or without constriction basally but bears 4-9 hairs. Hairs on subgenital plate arranged in more than two rows. Femora sparsely imbricated at least at tip; tibiae smooth; first tarsal chaetotaxy 3,3,3.

Discussion

Börner (1952) and Shaposhnikov (1964) recognize two subgenera, *Liosomaphis* and *Elatobium*, under the genus *Liosomaphis*. But the majority of workers are of the opinion that *Liosomaphis* and *Elatobium* are two distinct genera. This view is perhaps more rational because in *Elatobium* the siphunculi are cylindrical or very weakly clavate, ultimate rostral segment is distinctly shorter than hind tarsus 2 and both apterae and alatae lack extensive dorsal abdominal pigmentation (Raychaudhuri, 1983). The nature of the siphunculi in *Liosomaphis* and *Wahlgreniella* is more or less similar but the former genus is easily separated from the latter by the antennae as long as or longer than the body and ultimate rostral segment always longer than hind tarsus. It will perhaps not be out of place to draw a morphological relationship between *Liosomaphis* and *Amphorophora* since both these genera have swollen siphunculi coupled with smooth to nearly smooth head. But *Amphorophora* can well be distinguished by the first antennal segment bearing spinules near the outer margin, segment III bearing secondary rhinaria and by the spinulose second tarsal segment.

Following are the species under the genus *Liosomaphis* Walker. Validity and synonymy of the species is based on Remaudière and Remaudière (1997).

atra Hille Ris Lambers, 1966

=*neoempetri* A.K. Ghosh, R.C. Basu and D.N. Raychaudhuri, 1971 (*Wahlgreniella*) *berberidis* (Kalténbach, 1843) (*Aphis*)
ESPECE-TYPE

=*berberidis* Fitch, 1851 (*Aphis*)?

=*berberidis* Narzikulov, 1957

(*Rhopalalomyzus*)?

evadens Rusanova, 1942 nomen nudum [G.R. p. 280 et 304]

himalayensis A.N. Basu, 1964

ornata Miyazaki, 1971

rhododendrophila G.-x. Zhang, Zhong and

W.-y. Zhang, 1992

turanica Narzikulov, 1960

Key to the viviparous females of *Liosomaphis* Walker from India

1. Dorsum of the abdomen with dark pigmentation (Fig.1 I) and sclerotic pattern (Fig.1 H).....2

- Dorsum of the abdomen pale.....3
- 2. Processus terminalis 1.6–1.9 times as long as base of the last antennal segment. Dorsal pigmentation variable. Siphunculi (Fig.1 F) as long as head width across (including eyes).....**L. ornata Miyazaki**
- Processus terminalis 1.2–1.6 times as long as base of the last antennal segment. Dorsum usually with a complete shield. Siphunculus shorter than head width across eyes.....**L. atra Hille Ris Lambers**
- 3. ANT 0.52–0.73× body length, processus terminalis 1.6–2.1 times as long as base of the last antennal segment.....**L. himalayensis Basu**
- ANT 0.4–0.5× body length, processus terminalis 0.8–1.4 times as long as base of the last antennal segment.....**L. berberidis Kaltensch**

Description

Live aphid characters

Body oval to elongate, body yellowish green in younger specimens. Colour turns reddish-brown to dark brown as the aphid grows (Figs.1. A, B). Grown up aphid with paler thoracic segmental lines and a pale mid-dorsal line running from head to mid area of abdomen where it meets a dull central dorsal patch. Abdominal segments 1 to 6 dark brown but the segments beyond that become paler.

Characters of mounted female

The characters of mounted females are described in Fig. 1. Viviparous female is elongate to oval in shape (Fig. 1 I). Head smooth, pigmented, with dorsal setae 1/3-1/2 as long as middle width of 3rd antennal segment, with a pair of large, weak swellings mesially to eyes; antennal tubercle as high as or lower than median tubercle, with 2 setae apically (Fig.1 C). Antenna 6-segmented, about half as long as body; 3rd segment faintly imbricated, without rhinaria; processus terminalis 1.6-1.9 times as long as basal part of 6th (Fig.1 D). Thoracic tergites corrugated or papillated, with a brown colouration.

Rostrum reaching middle coxa; ultimate segment obtuse, 0.8-0.9 as long as 2nd segment of hind tarsus, about twice as long as wide, with 2 secondary setae (Fig.1 E) Femora smooth, sparsely imbricated at tip. Tibiae smooth, with setae at most as long as middle width of hind tibia. First tarsal chaetotaxy 3:3:3. Abdominal tergum sclerotized,

corrugated or papillated (Fig.1 H); 1st-6th tergites pigmented, usually irregularly lightened in colour mesially; 7th and 8th tergites each with a dark broad band; 2nd-4th tergites each with 5-8 short pointed setae besides marginal ones, without marginal tubercles; 8th with 4 or 5 at most as long as middle width of 3rd antennal segment. Siphunculus markedly swollen, more strongly convex on inner side than on outer side, smooth, with a few rows of transverse striae at apex, as long as or longer than head width across eyes, 2-3 times as long as cauda; largest diameter 1.6-2.1 times as large as smallest diameter of basal cylindrical portion, 2.1-3.3 times as large as smallest diameter just below flange (Fig.1 F). Cauda finger-shaped, blunt at apex, without constrictions, with 5-8 setae (Fig.1 G). First detailed description of this species has been provided by Miyazaki (1971).

Measurements in mm

Body 1.89; antennal segments (1st-6th): 0.08, 0.07, 0.28, 0.15, 0.12, 0.13+0.20; ultimate rostral segment 0.11; hind femur 0.5; hind tibia 0.86; hind tarsus (2nd segment) 0.12; siphunculus 0.51; cauda 0.21.

Specimens examined

17 females, Naggar, Kullu, Himachal Pradesh, India, 6.v.2013 on *Berberis lycium*.

Acknowledgments

The first author is thankful to the Director, CSIR-IHBT, Palampur for providing necessary facilities and to Mr. Varun Kumar for helping in collection of aphids during the survey and the CSIR-India for providing the funds to complete this study. We are grateful to Dr. Brij Lal, Senior Principal Scientist, CSIR-IHBT, Palampur for plant identification. The second author is thankful to the Director, National Bureau of Agricultural Insect Resources (ICAR-NBAIR), Bangalore, for providing facilities and to Mr. K. Harish and Mr. B. Manjunath for technical help. Authors also express sincere gratitude to Dr. Rajmohana Keloth and Dr. Vikas Kumar for reviewing the manuscript.

References

- Basu, A.N. 1964. New genera and species of aphids from the Darjeeling district, India (Homoptera: Aphididae). Zoological Journal of the Linnean Society of London,

First report of Aphid, *Liosomaphis ornata* Miyazaki (Hemiptera: Aphididae) from India

- Zoology 45(305): 223-243.
- Blackman, R.L. and Eastop, V.F. 2000. Aphids on the World's Crops: An Identification and Information Guide, Second Edition. New York: John Wiley and Sons, Ltd. 467 pp.
- Blackman, R.L. and Eastop, V.F. 2006. Aphids on the World's Herbaceous Plants and Shrubs. Chichester: John Wiley and Sons. 1439 pp.
- Börner, C. 1952. Europae centralis Aphides. Die Blattläuse Mitteleuropas: Namen, Synonyme, Wirtspflanzen, Generationszyklen. Mitteilungen der Thüringischen Botanischen Gesellschaft 3: 1-484.
- Eastop, V.F. and van Emden H.F. 1972. The insect material. In: H.F. van Emden (ed). Aphid Technology. London and New York: Academic Press. 31pp.
- Fitch, A. 1851. Catalogue with references and descriptions of the insects collected and arranged for the State Cabinet of Natural History, Fourth Annual Report of the New York State Cabinet of Natural History. Family Aphidae 42-69.
- Ghosh, A.K., Basu, R.C. and Raychaudhuri, D.N. 1971. On a collection of aphids (Homoptera: Aphididae) from Bhutan with descriptions of two new species. Kontyû 39(2):123.
- Hille Ris Lambers. D. 1966. New and little known aphids from Pakistan (Homoptera, Aphididae). Tijdschrift voor Entomologie 109: 211.
- Kaltenbach, J.H. 1843. Monographie der Familien der Pflanzenläuse (Phytophthires) (in German). Aachen, Roschütz 222 pp.
- Martin, J.H. 1983. The identification of common aphid pests of tropical agriculture. Tropical Pest Management 29: 395-411.
- Miyazaki, M. 1971. A revision of the tribe Macrosiphini of Japan (Homoptera: Aphididae, Aphidinae). Insecta Matsumurana: Journal of the Faculty of Agriculture, Hokkaido University, Series Entomology 34(1): 168-171.
- Narzikulov, M.N. 1957. New Species of Aphids (Homoptera, Aphididae) from the Mountain Regions of Tajikistan. Entomologicheskoe Obozrenie 36 (3): 671-694.
- Raychaudhuri, D.N. 1983. Food Plant Catalogue of Indian Aphididae. Calcutta: Aphidological Society of India. 202 pp.
- Remaudière, G. and Remaudière, M. 1997. Catalogue of World's Aphididae. Paris: INRA editions. 426 pp.
- Shaposhnikov, G. Kh. 1964. Suborder Aphidinea. In: G.Y. Bei-Bienko (ed). Key to the Insects of European Parts of USSR, Vol. 1, Leningrad: Zoological Institute of Academy of Sciences, USSR. (In Russian). 489-616 pp.
- Sood, P., Modgil, R. and Sood, M. 2012. Berberis lycium a medicinal plant with immense value. Indian Journal of Pharmaceutical and Biological Research 1: 1-9.
- Verma K.D. and Das, S.M. 1992. The Aphididae of North West India (With Special Reference to Aphids of Jammu and Kashmir State). Delhi: Ashish Publishing House. 177pp.
- Walker (1868) Notes on Aphides: The Zoologist Second Series 3(March): 1118-1123.
- Zhang, G.-x., Zhong and Zhang, W.-y. 1992. In: S.-x. Chen, (ed.). Homoptera: Aphidoidea, Insects of the Hengduan Mountains Region, Vol. 1. Beijing: Science Press. 377-398 pp.